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Preface: Fuzzy Logic Applications

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"If we want to control systems where no analytical model exists, we have to renounce an exact analytical proof of stability" conclude K. Michels and R. Kruse in the first paper of this special issue concerning numerical stability analysis for fuzzy control. Somehow, this sentence reflects the well-known tension existing between the "crisp-controller" and the "fuzzy-controller" communities. However, this tension is losing its emotional characteristics and is turning more and more into a contest of hard work and complex applications.

Two examples are presented as the second and third papers of this special issue: the application of fuzzy logic to weight control in paper machines, by J. Adamy, and the performance prediction for a rock-cutting trencher, by M. H. den Hartog and his coauthors. Both applications have been designed for industrial purposes and can be considered as building blocks for the "work-hard-and-apply" contest.

The subsequent two papers consider the field of fault diagnosis and quality monitoring. P. M. Frank and B. Köppen-Seliger refer to the call for fault tolerance in automatic control systems and show the way fuzzy logic and neural networks contribute to a better understanding of the topic. A. Grauel, L. A. Ludwig, and G. Klene compare fuzzy neural, evolutionary, and fuzzy clustering techniques and analyze these techniques to explain us how to obtain important (online) information about complex processes.

The complexity of the processes and the heterogeneity of interdependent subproblems lead to the development of integrated approaches in which several techniques complement each other. Besides established concepts like "fuzzy if-then rules," additional techniques are now used by

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engineers and developers. Optimization and decision analysis are examples of such techniques. Looking at the papers contained in this issue, we can see that the authors refer to these concepts several times. This observation indicates that engineers and system developers are adopting new fuzzy concepts, such as fuzzy decision analysis or fuzzy image analysis, when thinking about solutions for complex applications.

An application of fuzzy image analysis, by K. Lee and Z. Bien, completes this special issue. The authors propose a model-based machine vision system using fuzzy logic. Again different techniques such as pattern classification and matching are complemented by fuzzy techniques.

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